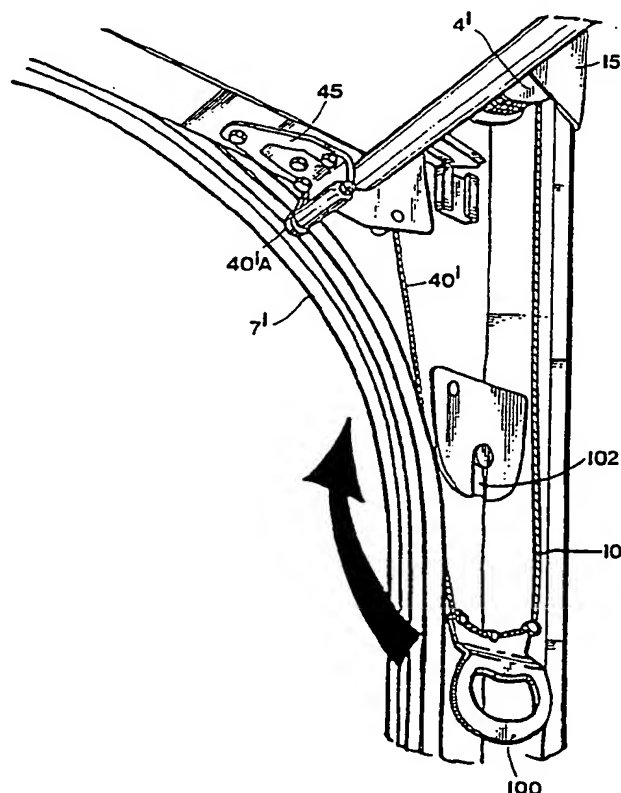




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>4</sup> :</b> <b>E05D 13/00, 15/24, 15/38</b> <b>E05F 1/06</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 90/03486</b> <b>(43) International Publication Date:</b> <b>5 April 1990 (05.04.90)</b>
<b>(21) International Application Number:</b> PCT/SE89/00525 <b>(22) International Filing Date:</b> 28 September 1989 (28.09.89) <b>(30) Priority data:</b> 8803465-7                      29 September 1988 (29.09.88) SE <b>(71) Applicant (for all designated States except US):</b> CRAWFORD GARAGE DOOR SYSTEMS AB [SE/SE]; Box 160, S-423 01 Torslanda (SE). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> BONDESSON, Olof [SE/SE]; Hagforsgatan 16, S-416 75 Göteborg (SE). <b>(74) Agent:</b> AWAPATENT AB; Box 53252, S-400 16 Göteborg (SE). <b>(81) Designated States:</b> AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent),		DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> INSTALLATION OF A DOOR SPRING SYSTEM  <b>(57) Abstract</b> <p>A method for simplified installation of cable-actuated door spring systems comprises pre-assembling a spring unit, which is thereafter lifted into position in brackets premounted above the door opening. The pre-assembly is effected by winding a length of cable onto the cable winding drum (4<sup>1</sup>), mounting the drum on the shaft, securing a torsion spring to the shaft and connecting it with fitting members mounted for turning movement about the shaft. The fitting members (14, 14<sup>1</sup>) of the spring unit thus formed are secured in the premounted brackets (15<sup>1</sup>), whereupon the cable (40<sup>1</sup>) is connected with the door with the spring in its relaxed position and, with the door in its raised position, the cable (40<sup>1</sup>) is unreeled and passed around a bottom pulley means (102) in order to provide the spring bias appropriate for said door.</p>		



***FOR THE PURPOSES OF INFORMATION ONLY***

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MR	Mauritania
BE	Belgium	GA	Gabon	MW	Malawi
BF	Burkina Fasso	GB	United Kingdom	NL	Netherlands
BG	Bulgaria	HU	Hungary	NO	Norway
BJ	Benin	IT	Italy	RO	Romania
BR	Brazil	JP	Japan	SD	Sudan
CA	Canada	KP	Democratic People's Republic of Korea	SE	Sweden
CF	Central African Republic	KR	Republic of Korea	SN	Senegal
CG	Congo	LI	Liechtenstein	SU	Soviet Union
CH	Switzerland	LK	Sri Lanka	TD	Chad
CM	Cameroon	LU	Luxembourg	TG	Togo
DE	Germany, Federal Republic of	MC	Monaco	US	United States of America
DK	Denmark				

INSTALLATION OF A DOOR SPRING SYSTEM

The subject invention concerns a method of installing door spring systems, according to which the cable winding drum, the spring, and the shaft associated with the door are secured above the door opening so as to  
5 allow the door and the cable winding drum to be interconnected by means of the cable.

The main purpose of the subject invention is primarily to make it possible to assemble and install the components incorporated in a spring system in a simple  
10 manner without causing hazards to the workmen installing the door but also to allow installation of the door without the aid of expensive professional workmen, thus making it suitable for do-it-yourself jobs. This is achieved by means of a suitable unit which is easily  
15 installed in operative position and interconnected with the associated door.

This purpose is achieved by means of a method of installing door spring systems in accordance with the subject invention, which method is essentially characterized by winding a length of cable adequate for the  
20 intended door onto the cable winding drum, attaching the drum to the shaft, placing a torsion spring over the shaft and attaching said spring securely to said shaft and connecting said spring with fitting members  
25 mounted for turning movement about said shaft, one at each spring end, whereby a spring unit is formed, lifting the unit thus formed and securing it in a premounted bracket, and thereafter interconnecting the cable and the door while the spring is in its relaxed position  
30 and unreeling the cable while the door is in its raised position.

One preferred embodiment of the invention will be described in closer detail in the following with reference to the accompanying drawings, wherein

35 Fig. 1 illustrates the installation of a door spring

system while lifting the spring unit and its associated parts.

Figs. 2-4 illustrate various stages of the installation procedure.

5 Fig. 5 is an exploded view of a part of a door spring system.

Figs. 6-11 illustrate various stages of the installation and

10 Fig. 12 illustrates a door equipped with the door-spring system after completed installation.

A door spring system 1 in accordance with the invention comprises at least one spring 3, which is coupled to a shaft 2, and a cable winding drum 4. By means of a cable, these components are to be connected to  
15 the door 5 which is guided along door guiding tracks 7 extending in the intended direction of movement 6 of the door. The door spring system also includes attachment brackets provided above the door opening 11 to support the guiding channels.

20 The spring 3 is preassembled into a unit 12 which preferably comprises a pair of springs 3, 3<sup>1</sup>, each one connected to its respective one of spring shafts 2, 2<sup>1</sup>, two cable winding drums 4, 4<sup>1</sup>, each one connected to its respective one of shafts 2, 2<sup>1</sup>, and a coupling  
25 member 13 interconnecting said shafts 2, 2<sup>1</sup>, as well as fitting members 14, 14<sup>1</sup>, each one mounted on its respective one of said shafts 2, 2<sup>1</sup>. In the fully installed position illustrated e.g. in Fig. 1, each fitting member 14, 14<sup>1</sup> is connected to its associated one of  
30 brackets 15, 15<sup>1</sup>, which are secured above the door opening 11. Each bracket 15, 15<sup>1</sup> is formed with a number of slots 17, 18, 19 which open in the direction indicated by 16 and which are designed to receive therein the associated shaft 2 or 2<sup>1</sup> and the associated fastener  
35 20 or 21.

Each bracket 15, 15<sup>1</sup> preferably has an oblique edge 22 including the slots 17, 18, 19, with the centrally

located slot 17 intended for reception therein of the shaft whereas the slots 18 and 19, positioned on either side of slot 17, are intended for reception of the fasteners 20 and 21, respectively. The reception slots  
5 17-19 extend outwards essentially perpendicularly to the door-defining wall 23.

The fitting members 14, 14<sup>1</sup> preferably are split into two parts which cooperate in pairs for exerting clamping action. The fitting member parts 14A, 14B  
10 and 14<sup>1</sup>A, 14<sup>1</sup>B of each pair are positioned one on either side of the associated bracket 15, 15<sup>1</sup> with which they are intended to be connected. Between the two parts 14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B of each fitting member extend, in the preinstallation position, said bolt fasteners  
15 20, 21 which are arranged to clamp the fitting member parts against the brackets 15, 15<sup>1</sup> sandwiched between said fitting member parts.

Also the centrally positioned spring shaft coupling member 13 is arranged to be supported at the centre  
20 of said unit, as illustrated in Fig. 9, by means of a centre bracket 24 attached to the wall 23. Also the centre bracket may be formed with slot recesses 8 in order to receive therein screws fasteners 10 for securing a shaft-mounted flange 9 to the centre bracket 24.

25 The split spring shaft fitting members 14, 14<sup>1</sup> are placed on the spring shaft 2, 2<sup>1</sup> with a shaft bearing 25 sandwiched between the fitting member parts 14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B, respectively. Said shaft bearing 25 is secured to the shaft and fixed in the desired  
30 position, e.g. by means of a number of clamping screws 26.

The springs 3, 3<sup>1</sup> preferably are torsion springs, more precisely helically coiled springs of the torsional type. The springs are coiled about and extend along  
35 their associated shaft 2, 2<sup>1</sup>. One of the spring ends 3A, 3<sup>1</sup>A, is attached to a spring attachment member 27,

27<sup>1</sup> which may be secured to the shaft 2, 2<sup>1</sup>, for instance by means of a number of clamping screws 28. By means of the opposite end 3B, 3<sup>1</sup>B, the springs 3, 3<sup>1</sup> are secured to the respective fitting member 14, 14<sup>1</sup>,  
5 which is mounted for free rotational movement about the shaft 2, 2<sup>1</sup>, preferably to the fitting member part 14A, 14<sup>1</sup>A positioned adjacent the associated spring 3, 3<sup>1</sup>, whereby said spring end 3B, 3<sup>1</sup>B will tend to rotate together with its associated fitting member part  
10 14A, 14<sup>1</sup>A.

The brackets 15, 15<sup>1</sup> preferably are arranged to be removably attached to the upper ends 29A, 29<sup>1</sup>A of door guide track sections 29, 29<sup>1</sup> which extend vertically when installed in the appropriate position for guidance  
15 of the door. Consequently, the brackets may easily be connected to the tracks on the ground, for instance by means of bolts 30, and be screwed to the wall 23 only when they have been placed in their final, fully mounted position, by means of screws 31.

20 In accordance with the illustrated embodiment the fasteners 20, 21 are received in apertures 32-35 passing through attachment lugs 36-39 positioned in diametrically opposed in each fitting member part.

A door spring system 1 in accordance with the subject  
25 invention thus may be produced in the following manner. One end 3A, 3<sup>1</sup>A of the spring 3, 3<sup>1</sup> is non-rotationally secured to the shaft 2, 2<sup>1</sup> to which the cable 40, 40<sup>1</sup> or other pulling means may be attached in such a manner that said spring end is non-rotational with respect  
30 to the shaft 2, 2<sup>1</sup>, whereas the opposite spring end 3B, 3<sup>1</sup>B is attached to its associated fitting member 14, 14<sup>1</sup> which is mounted on the shaft 2, 2<sup>1</sup> for free turning movement about the latter. Each fitting member is prepared for attachment to and securement in the  
35 matching, slotted attachment brackets 15, 15<sup>1</sup>. Before lifting the spring unit, thus preassembled at ground level to allow it to be received in the slots 17-19

5

formed in said brackets 15, 15<sup>1</sup>, the latter are attached in the desired position above the door opening 11.

More precisely, the fitting members 14, 14', preferably consisting of the paired fitting member parts 14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B, respectively, are preassembled by means of the bolt fasteners 20, 21 in such a manner that a gap of e.g. 5 mm is formed between the fitting member parts of each pair. In this gap the associated attachment bracket 15, 15<sup>1</sup> may be received and clamped in position, sandwiched between said fitting member parts, subsequently to the preassembled spring unit having been lifted manually by the workmen 41, 42 or mechanically. The latter procedure is not shown in the drawings and normally it is no longer necessary.

Preferably, the fitting member parts 14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B are turned into the desired positions prior to being bolted together in such a manner as to ensure a predetermined angle relatively to the departure of the cable from the drum 4, 4<sup>1</sup> in relation to the total cable winding A.

Onto the cable winding drum 4, 4<sup>1</sup> is wound the length of cable that is appropriate for the door 5 in question. The positions of the various parts which are respectively non-rotational and non-displaceable relatively to the shaft are easily determined before the unit is lifted. However, these positions could also be established after the assembly, lifting, and attachment of the unit in the brackets 15, 15<sup>1</sup>, following tightening of the bolts 20, 21 and clamping of the brackets 15, 15<sup>1</sup> between the fitting member parts 14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B with the shaft 2, 2<sup>1</sup> and the bolts 20, 21 being received in their respective one of slots 17-19.

The means making up a door spring unit 1 in accordance with the invention, which means comprise a spring 3, 3<sup>1</sup> coupled to a shaft, and a cable winding drum 4, 4<sup>1</sup>, said spring and drum being connected to the door 5 which is guided in door guide tracks 7, 7<sup>1</sup> extending

in the intended direction of door movement 6, also include the brackets 15, 15<sup>1</sup> for attachment of the door spring unit. As mentioned previously, the brackets are formed at one of their edges with open slots 17-19 for free  
5 reception therein of the fitting members 14, 14<sup>1</sup>, the shaft 2, 2<sup>1</sup> and the fasteners 20, 21 of the preassembled spring unit after lifting thereof. Slots 17-19 extend in a direction essentially perpendicularly outwards from an attachment piece 43, 43<sup>1</sup>, which may be an angle  
10 iron and which is connected to a wall 23, and the two bolt fastener receiving slots 18, 19 are positioned on either side of the central shaft reception slot 17.

Before the spring is placed in position, a length of wire A, appropriate for the door in question, is  
15 wound onto the cable winding drum 4, 4<sup>1</sup> which is secured to the shaft 2, 2<sup>1</sup>. A suitable torsion spring 3, 3<sup>1</sup> is placed over the shaft 2, 2<sup>1</sup> with one spring end 3A, 3<sup>1</sup>A secured to the shaft 2, 2<sup>1</sup> while the opposite spring end 3B, 3<sup>1</sup>B is secured to the fitting member which is  
20 mounted on the shaft for rotational movement about the latter. In this manner, a compact and easily manageable spring unit 12 is obtained which may be lifted and installed in position in the premounted appropriate brackets 15, 15<sup>1</sup> above the door opening 11 of the associated  
25 door. The two cable ends 40A, 40<sup>1</sup>A are thereafter attached to the bottom rolling guide pins 44, for instance by threading the cable ends over the pins and locking them in position by means of door guide member 45, which are attached to the associated door leaf 5A, for instance  
30 by means of screws 46.

The cable 40, 40<sup>1</sup> is thereafter connected to the door 5, the spring then being in the relaxed position. This position corresponds to the elevated position of the door wherein the latter is locked underneath a ceiling, as shown in Fig. 10, above the space that the door  
35 5 is intended to close against the action of the spring 3, 3<sup>1</sup>. The cable 40, 40<sup>1</sup> is thereafter unreeled from



7

the cable winding drum 4, 4<sup>1</sup> while the door 5 is in the elevated position, for instance with the aid of a pulling member 100 removably attached to the cable. The cable loop 101 thus formed is passed about lower  
5 pulley members 102 in order to provide the spring bias appropriate for the door 5.

Previously, before the unit 12 is secured in position, the fitting member parts 14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B incorporated in the unit 12 are set in the desired angular  
10 position relative to the direction of departure of the cable being unwound from the cable winding drum 4, 4<sup>1</sup>.

Also the end positions of the spring ends are set and the ends are secured to the spring shaft 2, 2<sup>1</sup> in dependence on the desired spring tension.

15 The installation operation also includes introducing the spring shaft 2, 2<sup>1</sup> and the fastener members 20, 21 incorporated in the fitting members 14, 14<sup>1</sup> radially in the direction indicated by 103 relative to the spring shaft into the associated open-mouth slots with sub-  
20 sequent tightening of the fastener members 20, 21 to clamp the sandwiched brackets 15, 15<sup>1</sup> in position.

The fitting member parts 14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B preferably are interconnected by means of bolt fasteners 20, 21 in such a manner that a gap is formed between  
25 said parts for reception therein of said brackets 15, 15<sup>1</sup>.

The invention is not limited to the embodiment described herein and illustrated in the drawings but could be modified in a variety of ways within the scope  
30 of the appended claims without departure from the inventive idea.

## CLAIMS

1. A method of installing a door spring system, comprising securing the cable winding drum (4, 4<sup>1</sup>), the spring (3, 3<sup>1</sup>), and the shaft (2, 2<sup>1</sup>) associated with the door (5) above the door opening (11) so as to  
5 allow interconnection of the door (5) and the cable winding drum (4, 4<sup>1</sup>) by means of a cable (40, 40<sup>1</sup>), characterized by winding a length of cable (A) adequate for the intended door (5) onto the cable winding drum (4, 4<sup>1</sup>), attaching said drum to the  
10 shaft (2, 2<sup>1</sup>), placing a torsion spring (3, 3<sup>1</sup>) over the shaft and attaching said spring securely to said shaft and connecting said spring with fitting members (14, 14<sup>1</sup>) mounted for turning movement about said shaft, one at each spring end (3A, 3B; 3<sup>1</sup>A, 3<sup>1</sup>B), whereby a  
15 spring unit (12) is formed, lifting the unit (12) thus formed and securing it in a premounted bracket (15, 15<sup>1</sup>), and thereafter interconnecting the cable (40, 40<sup>1</sup>) and the door (5) while the spring is in its relaxed position, unreeling the cable (40, 40<sup>1</sup>) while the door  
20 is in its raised position and passing said cable (40, 40<sup>1</sup>) in a loop (101) around bottom pulley means (102) so as to provide the spring bias appropriate for said door.
2. An installation method as claimed in claim 1, characterized by setting the fitting members (14, 14<sup>1</sup>) incorporated in the unit (12) at a predetermined angle relatively to the departure of the cable from the cable winding drum.
3. An installation method as claimed in any one  
30 of the preceding claims, characterized by setting the end position of each spring end and securing said spring ends to the spring shaft (2, 2<sup>1</sup>) in dependence of the desired spring tension.
4. An installation method as claimed in any one

of the preceding claims, characterized by introducing said spring shaft (2, 2<sup>1</sup>) and the associated fastener elements (20, 21) pertaining to said fitting member (14, 14<sup>1</sup>) in a radial direction (103) in relation to said spring shaft (2, 2<sup>1</sup>) into suitable open-mouth slots (17-19).

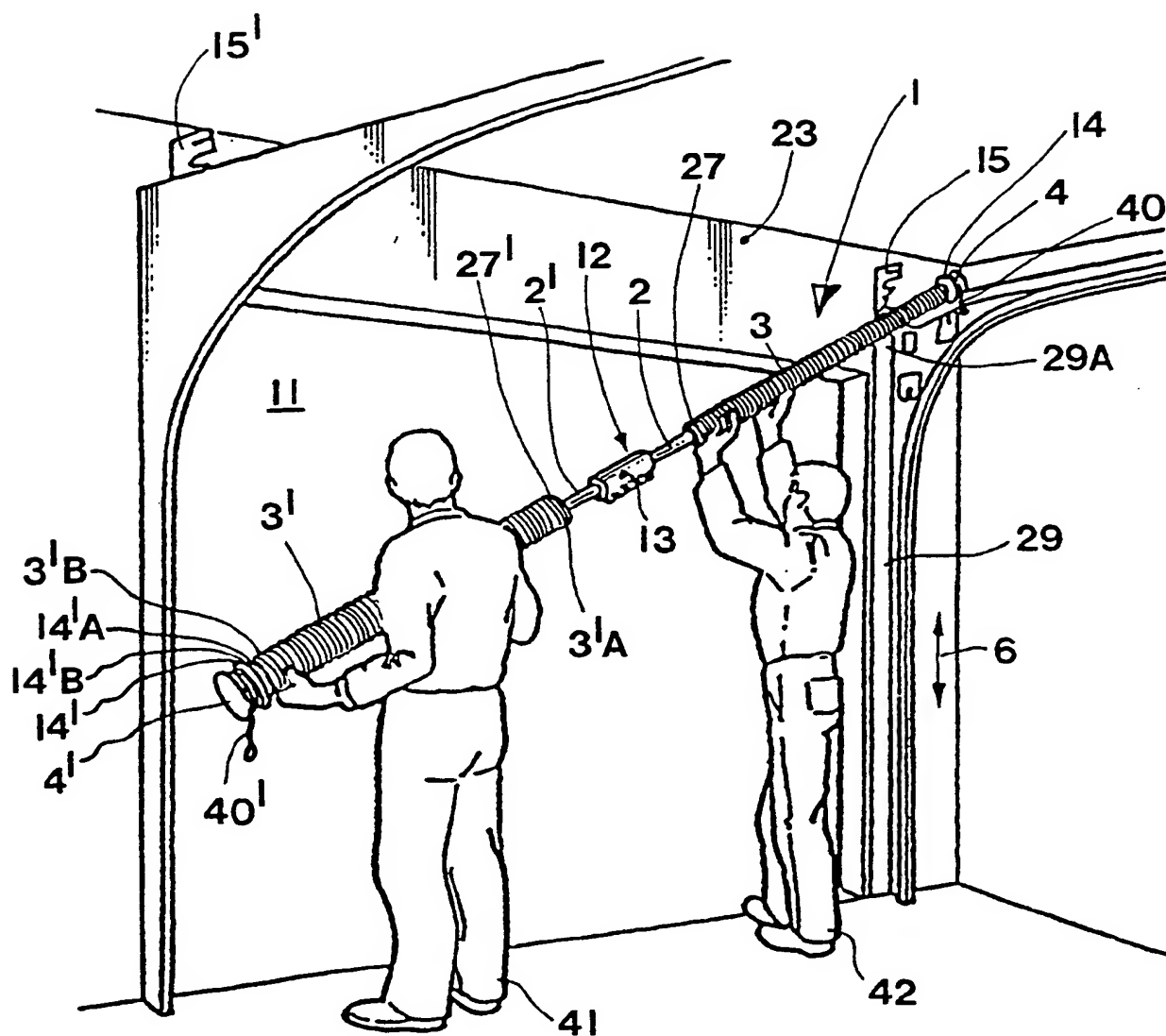
5           5. An installation method as claimed in claim 4, characterized by interconnecting the fitting member parts (14A, 14B and 14<sup>1</sup>A, 14<sup>1</sup>B) of each fitting member (14, 14<sup>1</sup>) by means of bolt fasteners (20, 21) in such a manner that a gap is formed between said fitting member parts for reception in said gap of said bracket (15, 15<sup>1</sup>).

15           6. An installation method as claimed in any one of the preceding claims, characterized by joining each cable end (40A, 40<sup>1</sup>A) to the lowermost one (44) of the track-mounted roller guide pins of said door.

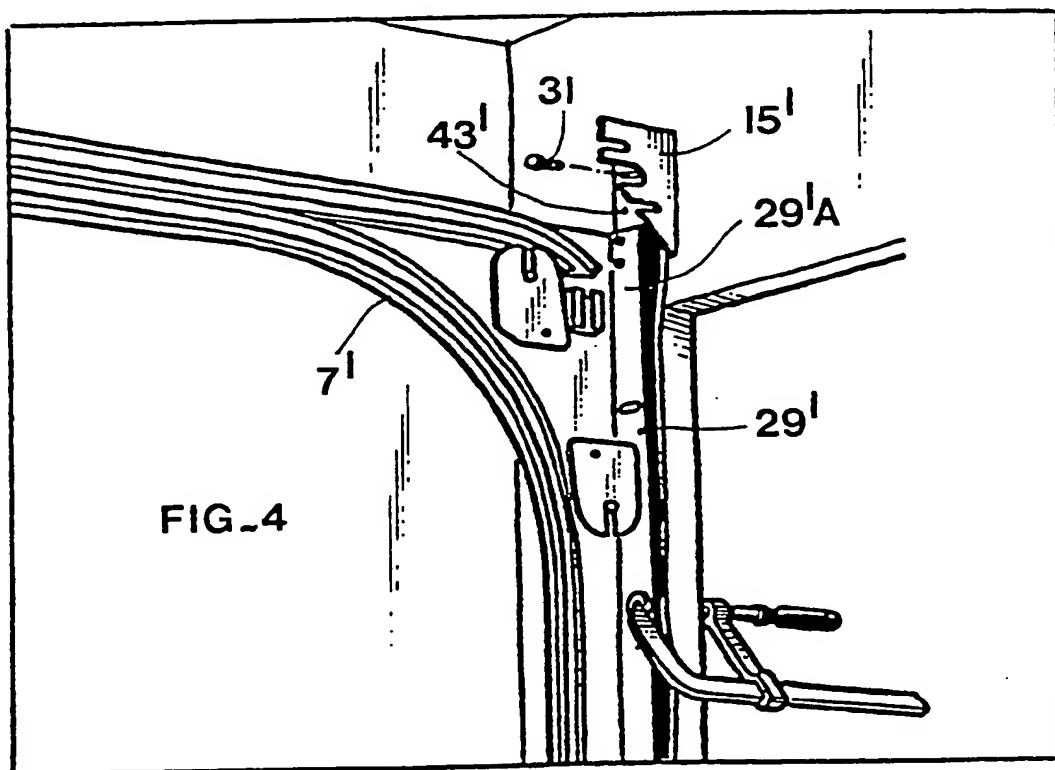
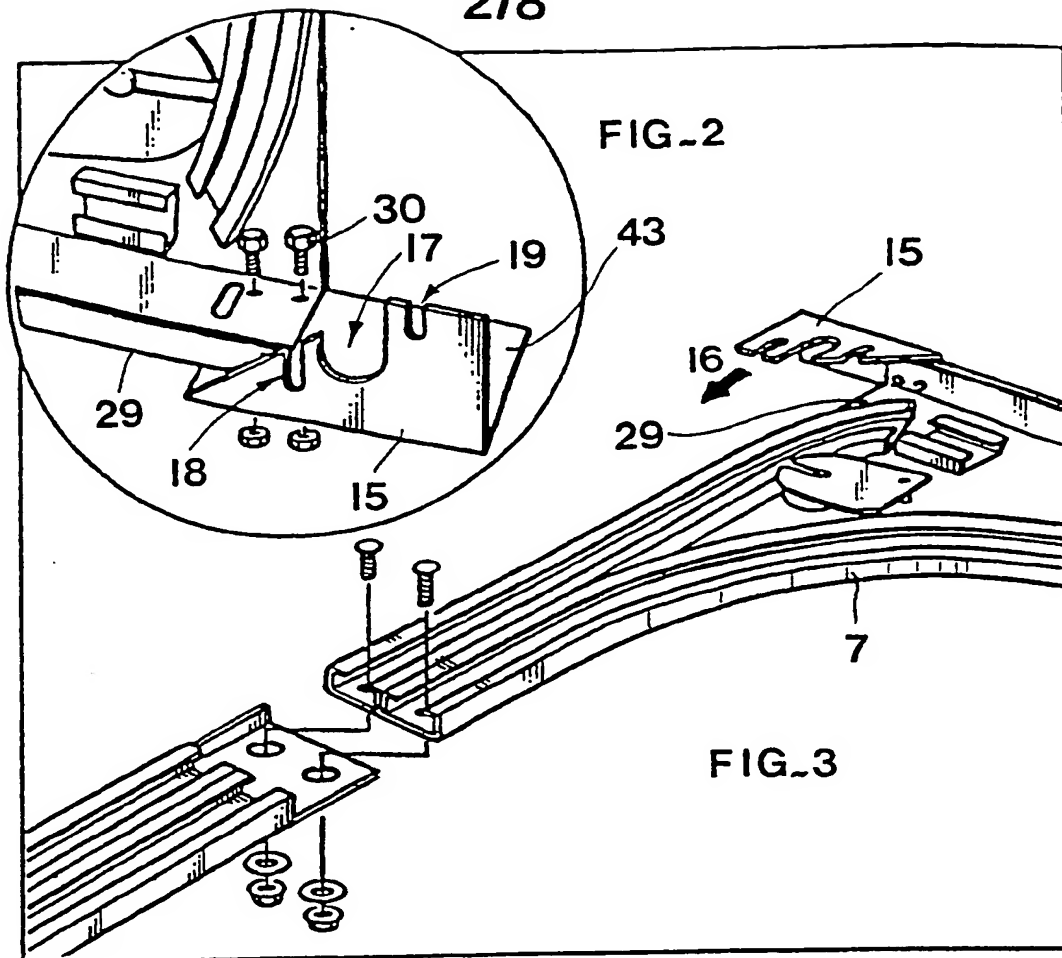
20           7. An installation method as claimed in any one of the preceding claims, characterized by unreeling the cable (40, 40<sup>1</sup>) from the drum (4, 4<sup>1</sup>) by means of a pulling member (100) which is removably attached to said cable (40, 40<sup>1</sup>) prior to loading said spring (3, 3<sup>1</sup>) by the weight of the door (5).

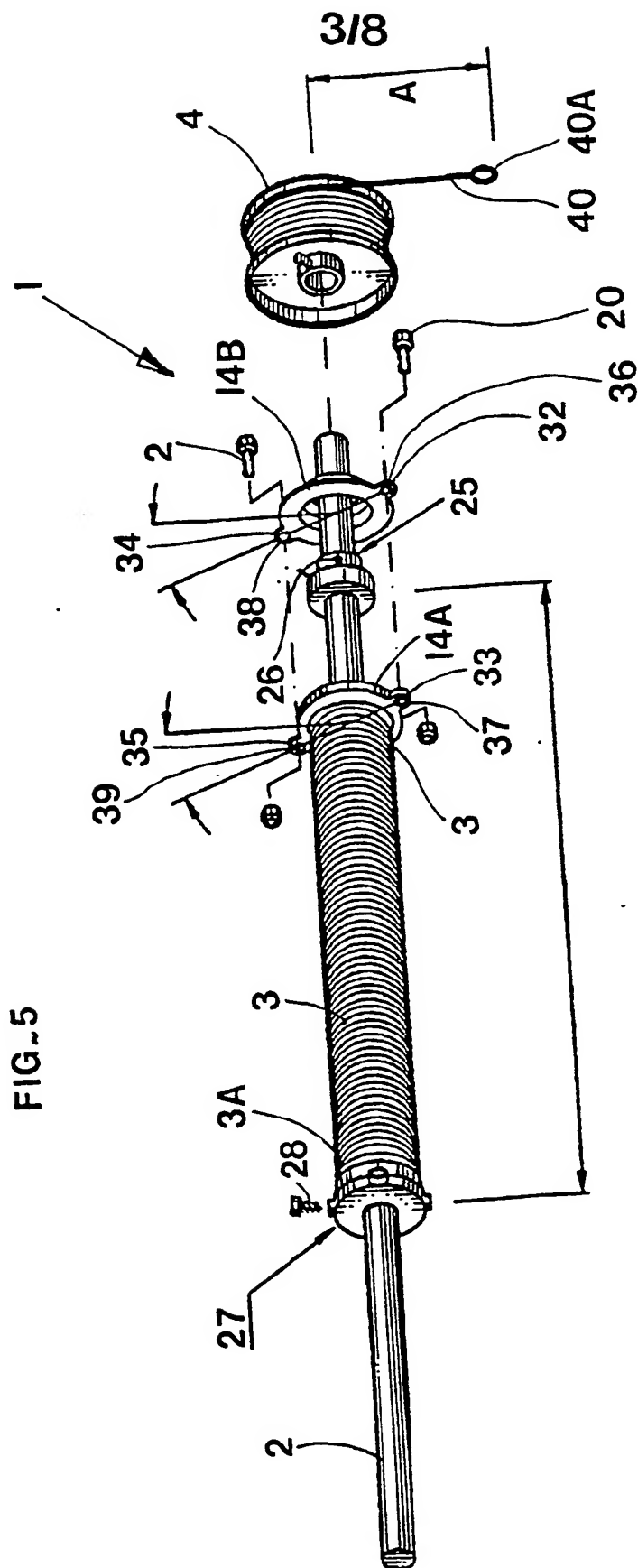
1/8

FIG. 1

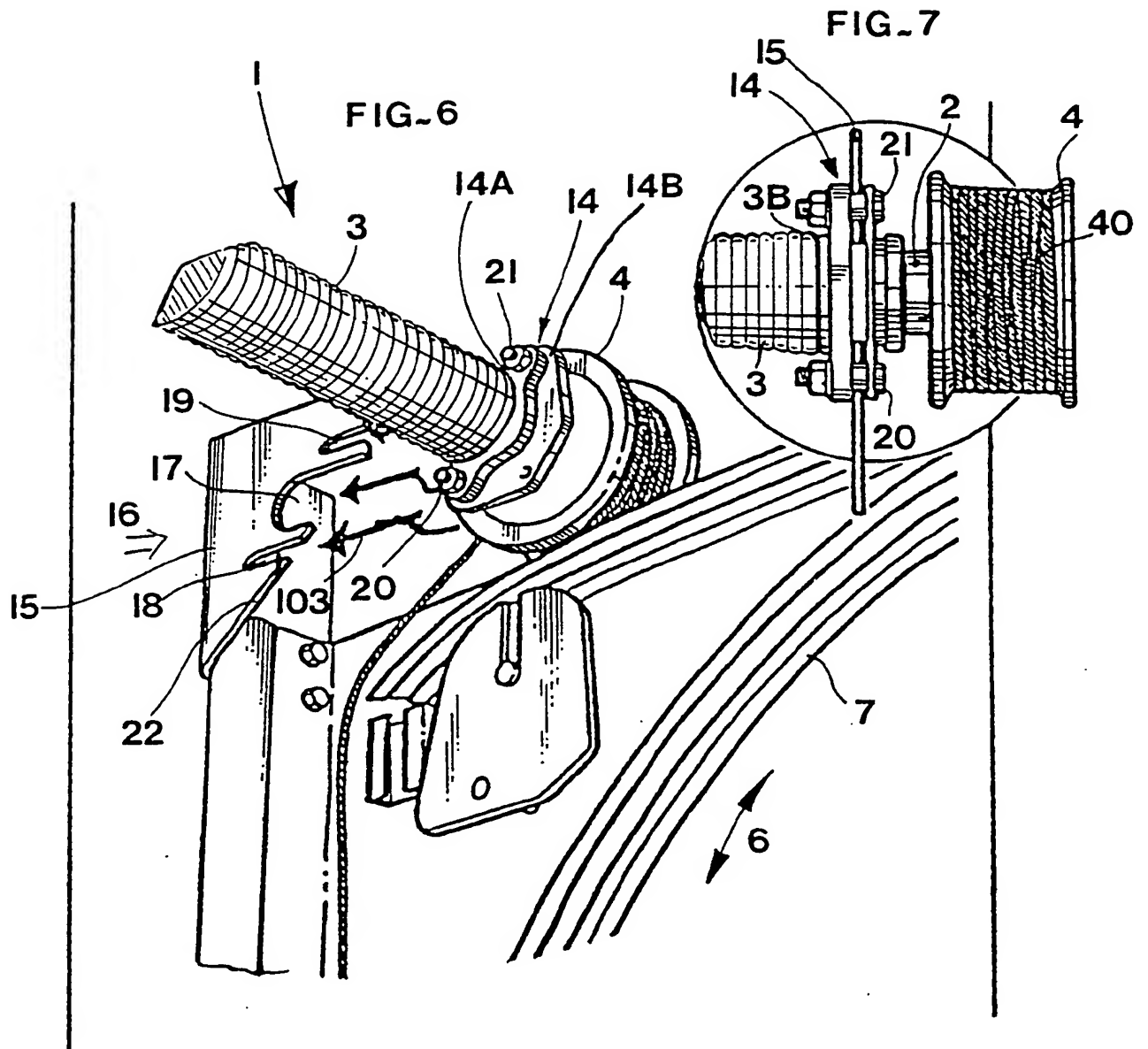


2/8





418

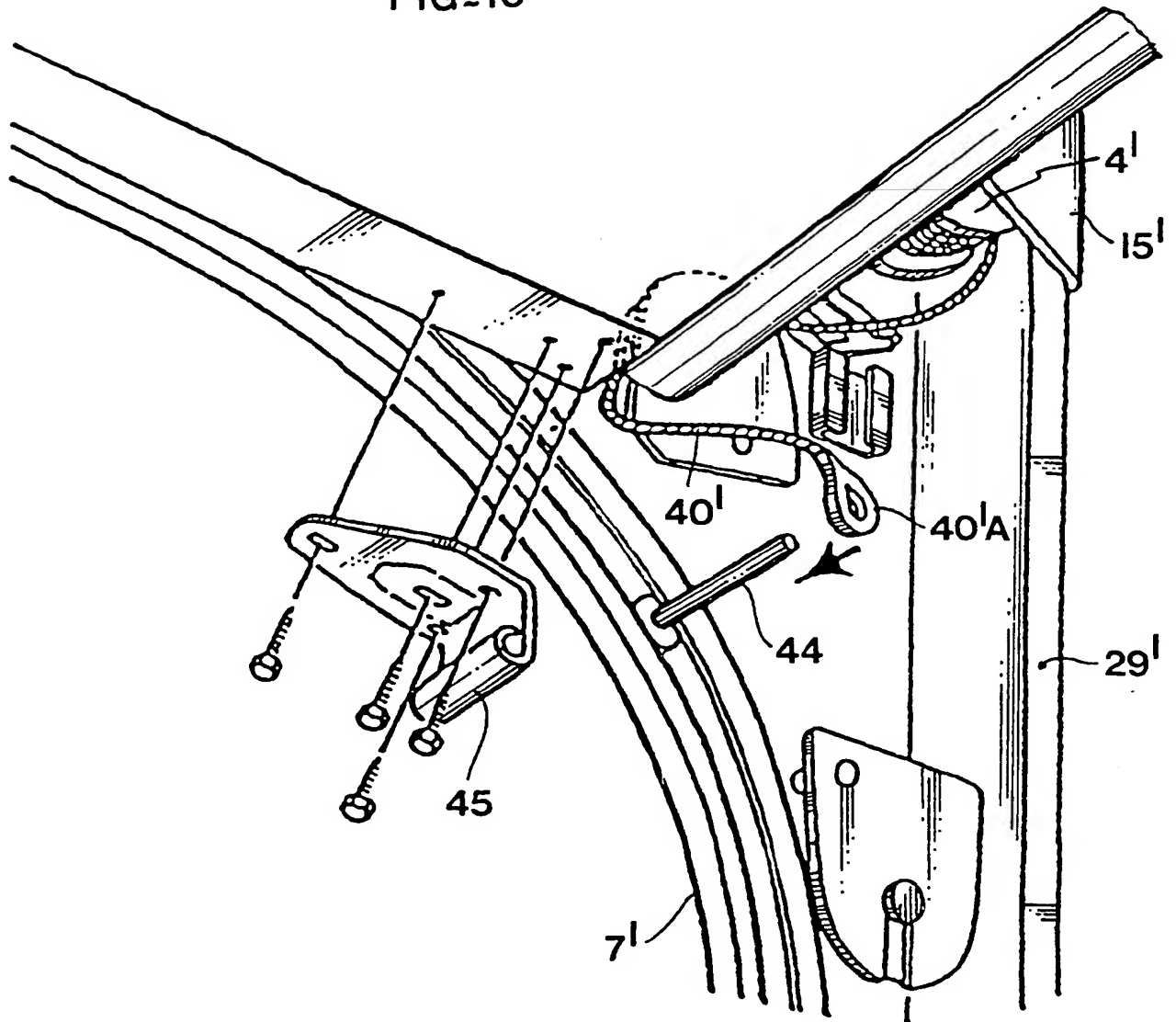






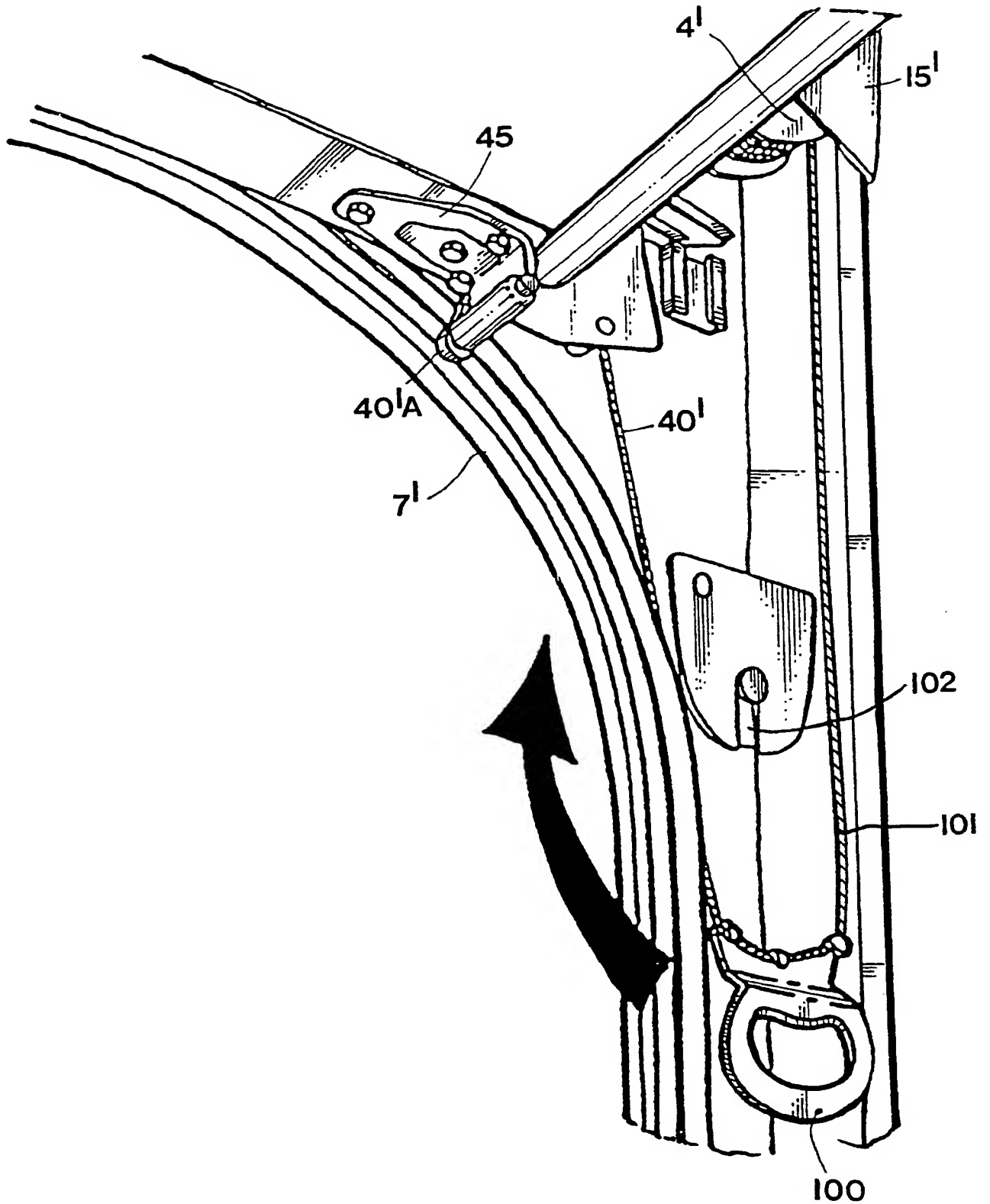
6/8

FIG-10



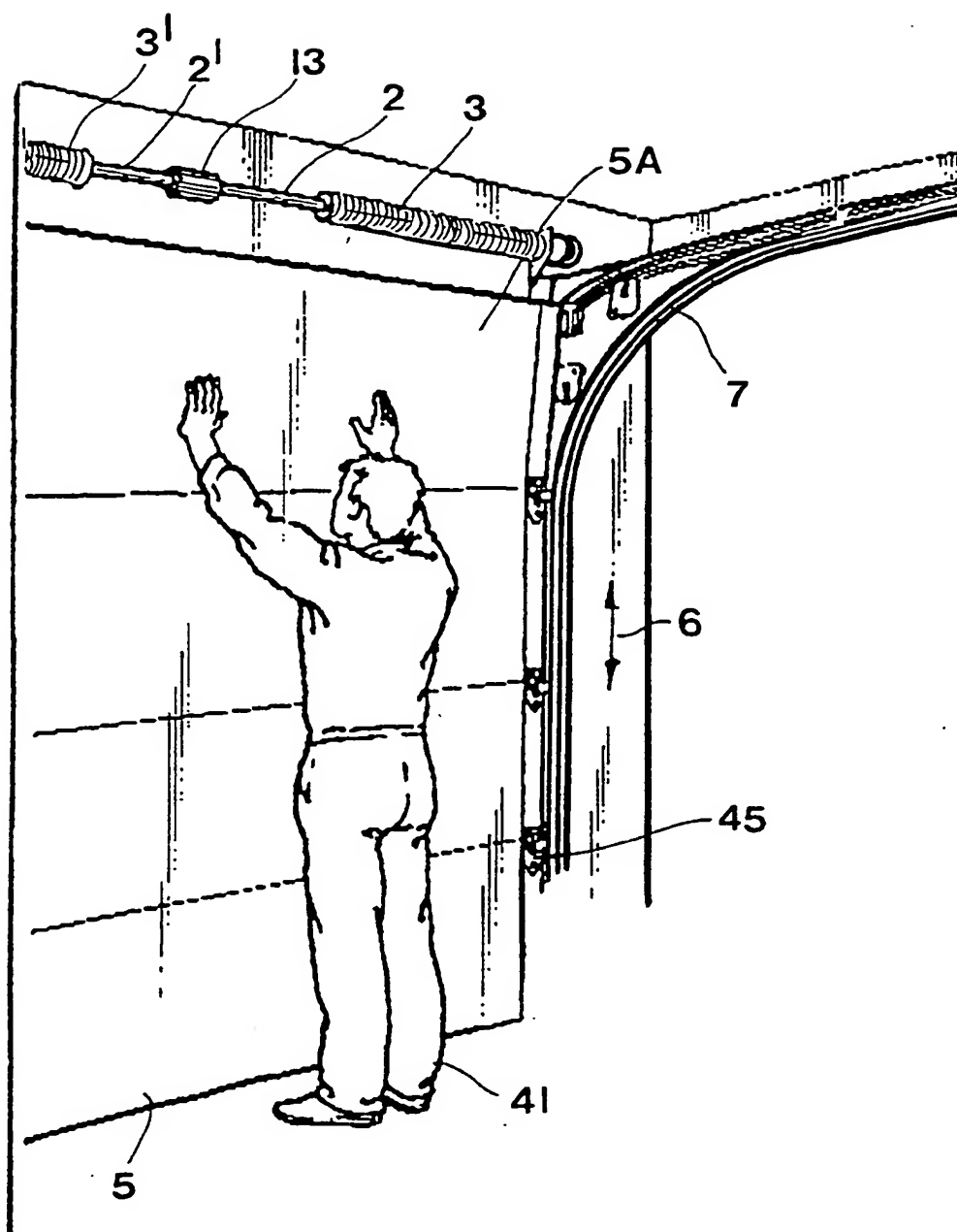
718

FIG. II



8/8


FIG. 12



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/SE 89/00525

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC4: E 05 D 13/00, 15/24, 15/38, E 05 F 1/06</b>		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC4	E 05 D; E 05 F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	US, A, 3038535 (E.L. STROUP ET AL) 12 June 1962, see the whole document --	
A	US, A, 2093019 (W.A. NORBERG) 14 September 1937, see the whole document --	
A	US, A, 4731905 (MILANO ET AL) 22 March 1988, see the whole document -- -----	
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <b>12th December 1989</b>	Date of Mailing of this International Search Report <b>1989 -12- 15</b>	
International Searching Authority <b>SWEDISH PATENT OFFICE</b>	Signature of Authorized Officer  <b>Christer Wendenius</b>	

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 89/00525

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3038535	12/06/62	NONE	
US-A- 2093019	14/09/37	NONE	
US-A- 4731905	22/03/88	NONE	

**THIS PAGE BLANK (USPTO)**

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**

**THIS PAGE BLANK (USPTO)**